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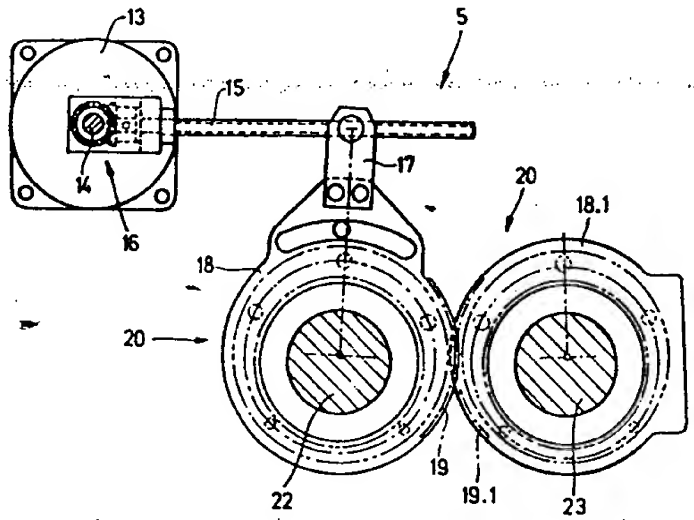
(54) **MECANISME DE REGLAGE POUR DISPOSITIF DE PLIAGE D'UN MATERIAU EN BANDE**

(54) **CROSS PERFORATOR ADJUSTMENT MECHANISM**



(57) The invention concerns a device for processing a web of material entering into a folding unit prior to severing single products from said web of material. The folding unit has a processing unit with two cooperating cylinders. The cylinders are supported by housings mounted in a frame of the folding unit. A device for changing the effective diameter as well as the center to center distance between said cooperating cylinders upon changes of cut-off length, allows for obtaining a match of the circumferential motion of said cylinder to secure a clean perforation position without any gain.

Cross Perforator Adjustment Mechanism

Field of the Invention

The present invention concerns a device for perforating or performing another processing operation on a web of material entering into a folder.

Background of the Invention

U.S. Patent No. 2,832,411 discloses a perforating blade holding means. A cylinder comprises a longitudinal recess, with the recess lying at an angle with respect to the axis of said cylinder. A blade member is seated in the recess and longitudinally moving clamping devices in the recess abut the blade member. The clamping devices are formed so as to grip the blade therebetween by relative movement of said devices. Thus, the alignment of said blade member is maintained, effecting adjustment of the same. Simplified removal and replacement of a blade is possible should such be necessary.

U.S. Patent No. 4,055,101 shows a roll fed rotating web device with improved perforator. The perforator is incorporated in a standard perforating cylinder which rotates during the process of perforation. A plurality of perforating blades are mounted in the perforating cylinder and several improvements relating to spring biased positioners of the perforating blades are disclosed. The blade seatings each comprise a support element which is deformable by pressure applied to the perforating blade.

In the technical field related to cut-off-length adjustments in folders, a significant

problem has been experienced in that these adjustments result in a change in gain or overspeed of perforating cylinders. The change in gain is not acceptable during cross perforating since tearing and perforating elongations in the products, subsequently severed from the web of material, occur. If, for example upon one revolution of the perforating-knife cylinder, three perforations are performed, the exact position of each of the cross perforations cannot be maintained due to changes in gain resulting in a poor quality of double-parallel-folded-products.

Summary of the Invention

An object of the present invention is to provide a perforating unit for variable cut-offs without gearing or part changes in the unit.

Furthermore it is an object of the present invention to eliminate gain changes due to speed changes or cut-off length adjustments.

Another object of the present invention is to improve perforating quality by eliminating web-tearing and perforating elongations.

A further object of the present invention is to maintain the perforating surfaces on the center line of the paper path, thus minimizing batting of the ribbons.

According to the invention, an apparatus for processing a web of material entering into a folding unit prior to severing single products from said web of material, includes:

- a processing unit having two cooperating cylinders,
- said cylinders being supported in respective housings in a frame of said folding unit and
- a device for changing the effective diameter and changing the center to

center distance between said cooperating cylinders simultaneously upon variations in speed or cut-off.

By means of a configuration according to the present invention, the cooperating cylinders maintain a zero gain which produces an accurate perforation and eliminates perforation elongations during contact of perforating members on said cooperating cylinders. Since both cooperating cylinders are mounted movably, the web of material passing will always be in the center of the nip between both cooperating cylinders, thus enhancing cross perforating accuracy.

The housings supporting the respective ends of said cooperating cylinders are mounted in actuators, which move eccentrically. Since the actuators engage each other upon a rotational movement - in clockwise as well as in counterclockwise direction - the movement of one actuator simultaneously results in a corresponding movement of the remaining actuator. Due to the eccentric movement of the cooperating cylinders, driving joints of the cylinders are mounted to compensate for the relative movement of said cylinders in respect to the folding units side frames. At least one knife box or a cutting anvil can be assigned to each of the cylinders depending on whether the use is for double parallel or tabloid folding mode. In order to adjust the cooperating cylinders, adjusting layers, otherwise known as shims, are mounted below the knife boxes and cutting anvils adjusting the effective diameter and surface speed of the cooperating cylinders. Thus, a perfect match of perforation motion to single product at each cut-off can be achieved resulting in zero gain, eliminating perforating tearing and perforating elongations, thus increasing product quality substantially.

Brief Description of the Drawings

These and other features of the present invention will become apparent to those skilled in the art upon reading the following detailed description of the invention with reference to the accompanying drawings in which:

Fig. 1 shows an overall folder diagram from a former to a product transfer cylinder,

Fig. 2 shows a cross section through a perforating unit with a corresponding perforating unit drive,

Fig. 3 shows the center adjusting device in greater detail,

Fig. 4 shows an embodiment of the invention with a triple cross perforation for use with double-parallel-products and

Fig. 5 shows perforating cylinders for cross perforation use with tabloid or quarter fold products.

Detailed Description

Fig. 1 shows an overall folder diagram from a former to a product transfer cylinder.

A folding unit 1 includes a former 2 for generating a first longitudinal fold in a web moving in direction of the vertically extending dashed-lined center line of the former 2. Below the former 2 a pair of lower former rolls 3 is arranged. The longitudinally folded web of material is being squeezed by a pair of upper nip rolls 4 before a cross perforation is applied in a cross perforator 5 shown in greater detail in Figs. 2-5. Below the cross perforator 5 a pair of lower nip rolls 6 is arranged. Cutting cylinders 7 on each revolution severe a single product from the web of material, the single products being seized by first and second accelerator tapes 8, 9, respectively. The accelerator tapes 8, 9 deliver the cut single products to a product transfer cylinder 10, cooperating with further folding cylinders of the folding unit 1.

Fig. 2 shows a cross section through a perforating unit with a corresponding cross perforator drive on the gear side frame.

A spindle 14 extends across the width of the folding unit 1 being supported on both ends by a gear side frame 12 and a work side frame 11. The spindle 14 is driven by an adjusting drive 13 mounted on the work side frame 11. Furthermore, the spindle 14 includes two gearings 16 to each of which a threaded shaft 15 is assigned. Each shaft 15 is connected to a bracket 17, the brackets 17 being mounted on eccentric actuators 18. By means of the eccentric actuators 18, eccentric housings 20 are moved rotationally about centerlines of the perforating cylinders, i.e. a knife cylinder 22 and an anvil cylinder 23. By means of bearings 21, stub shafts of the cylinders are supported in the eccentric housings 20 on a work side and a gear side, respectively.

As shown more clearly in Fig. 3, eccentric actuators 18, 18.1 mounted on gear side and work side frames include toothed segments 19, 19.1, respectively. The toothed segments 19 and 19.1 mesh with each other. Consequently, upon rotational movement of eccentric actuator 18, caused by rotating of threaded shaft 15 in bracket 17, due to meshing engagement, the eccentric actuator 18.1, will move about the same amount in a clockwise or counterclockwise direction. Since the eccentric housings 20 are mounted on the eccentric actuators 18, 18.1, the rotational movement will cause a center to center movement of knife cylinder 22 and anvil cylinder 23 simultaneously about the same amount. Since the eccentric actuators 18 and 18.1 on the work side and the gear side are rotated simultaneously, a horizontal shifting of said perforating cylinders 22, 23 can be achieved. Thus, the nip between said cylinders 22, 23 is broadened by moving not only one cylinder relative to the other, but moving both cylinders simultaneously about an identical amount, thus maintaining a center position of the web of material to be cross perforated within the cross perforator unit 5.

As shown in Fig. 2, the gear side frame 12 includes the drive of the cross perforator cylinders 22, 23. Since the housings 20 of the cylinders 22, 23 can be eccentrically moved, the corresponding drive shafts 24, 25 are arranged such to compensate for the eccentric moving of said cylinders. The drive is transmitted to said driving

shafts 24, 25 by means of gears 26, 27 meshing with each other. The gear 27 is driven by a drive gear 28 mounted on a drive shaft 29.

The knife cylinder 22 includes at least one knife box 30 mounted on its circumference, shown in greater detail in Figs. 3 and 4. The corresponding anvil cylinder 23, consequently, has a number of cutting rubbers 31 on its circumference corresponding to the number of knife boxes 30 assigned to the knife cylinder's 22 circumference.

Fig. 3 shows a center adjustment device in greater detail.

The adjustment members of said cross perforator 5 are shown in larger scale. The knife cylinder 22 and the anvil cylinder 23 each are supported by housings 20 being mounted in the eccentric actuators 18 and 18.1. As shown in Fig. 3, each of the eccentric actuators 18 and 18.1 comprises a toothed segment 19, 19.1 respectively. Both toothed segments 19 and 19.1 mesh to each other. Spindle 14 drawn in cross section will drive threaded shafts 15 via the intermediate gearing 16, thus moving brackets 17 mounted on said eccentric actuator 18 in clockwise or counterclockwise direction. Since both actuators 18, 18.1 mesh with each other, the rotational movement of the adjustor 18 assigned to the knife cylinder 22 results in a corresponding rotational movement of the actuator 18.1 assigned to the anvil cylinder 23, thus causing a center to center adjustment of the cylinders. A pin is provided in recess of actuator 18 to limit rotational movement of said eccentric actuators 18 and 18.1.

Fig. 4 shows a cross perforating arrangement providing several cross perforations upon one revolution.

In this configuration two knife boxes 30 are assigned to the knife cylinder 22, whereas a further knife box 30 is mounted on the anvil cylinder 23. This allows for cross perforations to be performed in the same direction as the cross folds during

further processing of the single products. Consequently, by means of the knife boxes 30 assigned to the knife cylinders 22, a cross perforation corresponding to the first parallel fold and a cross perforation corresponding to a jaw fold can be performed, whereas the knife box 30 assigned to the anvil cylinder 23 performs a cross perforation corresponding to the second parallel fold.

As can be derived from Fig. 4, adjusting layers or shims 32 are assigned to knife boxes 30 as well as to cutting rubbers 31, placed in recesses on said cylinders 22, 23, respectively. Since the layers 32 are of a rigid material, an effective diameter 39 of said cylinders 22, 23 and their surface speed can be changed, thus allowing a perfect match, a zero gain of the perforating surfaces cooperating with each other. As can be seen in Fig. 4 the adjusting layers 32 are placed beneath knife boxes 30 and cutting anvils 31. The knife boxes 30 are fastened by means of screws 33 and 34, the perforating knives 38 being penetrated by screws 37 within said knife boxes 30.

Fig. 5 shows a configuration of a cross perforating unit for use in tabloid or quarter folding.

With this configuration, upon one revolution of the perforating cylinders 22, 23 one cross perforation is performed. The knife box 30 as well as the cutting rubber 31 has an adjusting layer 32 underneath to influence an effective diameter 39 of the pair of cylinders 22, 23 so that upon perforating contact an elongation of perforation does not occur. By means of the adjusting layer 32 a perforating area in the nip is almost line-shaped - relative to the width of the cylinders 22, 23 - rather than a contacting area causing slits in said single products.

The perforation arrangement according to Fig. 5 also allows for a removal of air out of a multi-layer single product and can provide a predetermined weakness in the material to be folded resulting in an increased folding accuracy.

A further application of the present invention in gravure machines having variable cut-offs can be performed by replacing the adjusting layer 32 in a recesses of said knife boxes 30 and cutting rubbers 31 by lifting devices beneath cutting rubber 31 and knife box 30 such as jacking screws or eccentric lifts. Those lifting devices will facilitate a more rapid change over for a new cut-off length to be adjusted.

CLAIMS:

1. An apparatus for processing a web of material comprising a first cylinder and a second cylinder with a space between said cylinders for passing a web material therethrough, each cylinder having a central axis and being rotatably supported by a housing, each housing being rotatable about a central axis offset relative to the axis of the respective cylinder; and an adjustment device coupled to said housings for rotation thereof, which when activated causes movement of both cylinders in a manner to increase the space between said cylinders or in a manner to decrease the space between said cylinders.

2. The apparatus as claimed in Claim 1, wherein the adjustment device comprises a geared arrangement for rotating the housings.

3. The apparatus as claimed in Claim 1, wherein said adjustment device includes two gears in mesh, with one gear rotatable about the central axis of one housing and the other gear rotatable about the central axis of the other housing.

4. The apparatus as claimed in claim 2, wherein said adjustment device includes a single drive for driving said geared arrangement.

5. The apparatus as recited in claim 2, wherein said adjustment device includes meshing toothed segments attached to said housings for rotating said housings and changing the spacing of said cylinders.

6. The apparatus as claimed in claim 1, wherein said adjustment mechanism includes one drive controlling both cylinders.

7. The apparatus as claimed in claim 2, wherein said adjustment mechanism includes a linkage for directly

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rotating one of said housings and indirectly rotating the other housing.

8. The apparatus as claimed in claim 1 further comprising joints for driving the first and second cylinders and for compensating for a movement of said cylinders.

9. The apparatus as claimed in claim 1 wherein at least one of said first and second cylinders comprises at least one knife box.

10. The apparatus as claimed in claim 1, wherein at least one of the first and second cylinders has at least one cutting anvil on its surface.

11. The apparatus as claimed in claim 1, wherein at least one of the first and second cylinders have recesses and have adjusting layers assigned to said recesses.

12. An apparatus for processing a web of material comprising a first cylinder and a second cylinder with a space between said cylinders for passing a web of material therethrough, each cylinder being rotatably supported by a housing, each housing being rotatable for adjusting the position of the respective cylinder supported in the housing relative to the other cylinder for altering the center to center distance of said cylinders, said cylinders being supported in said housings at a position offset relative to a center of rotation of said housing, and wherein said housings are coupled such that rotational movement of one housing causes a similar movement of the other housing and a cooperative movement of said cylinders altering the separation thereof.

13. An apparatus as claimed in claim 12, wherein said housings are connected by a gear arrangement where rotation of one housing causes an opposite rotation of the other housing.

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14. An apparatus as claimed in claim 13, including a single drive attached to one of said housings which controls the position of both of said housings.

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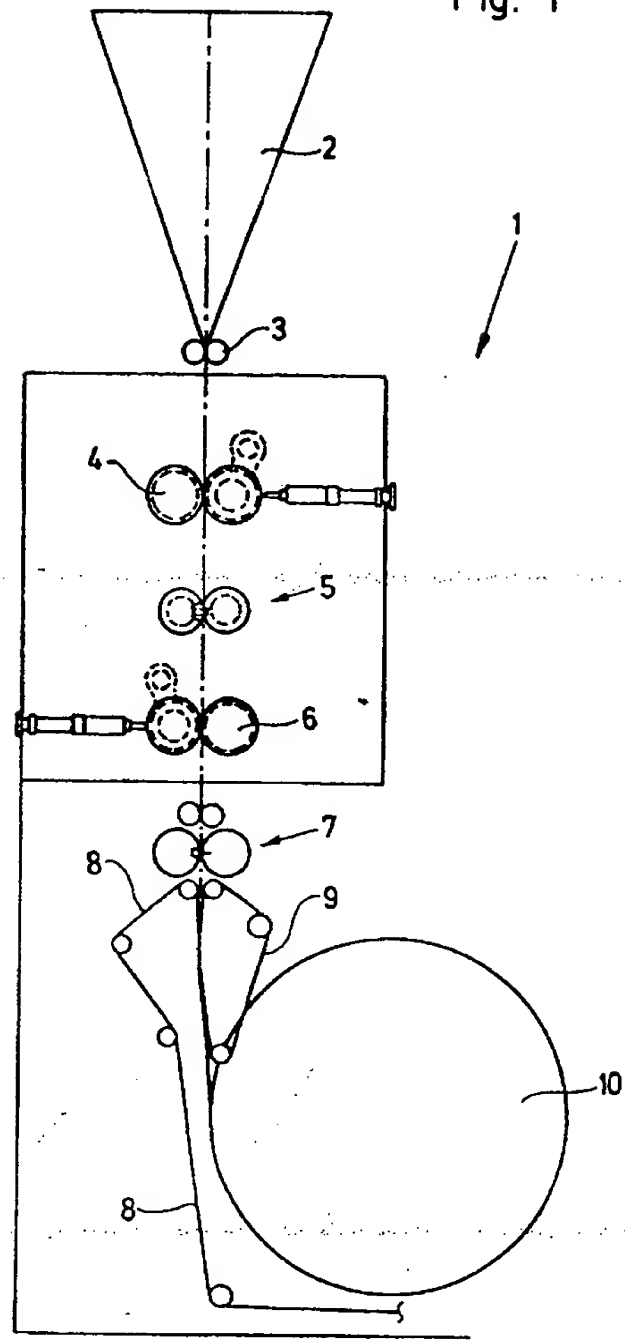
Fig. 1



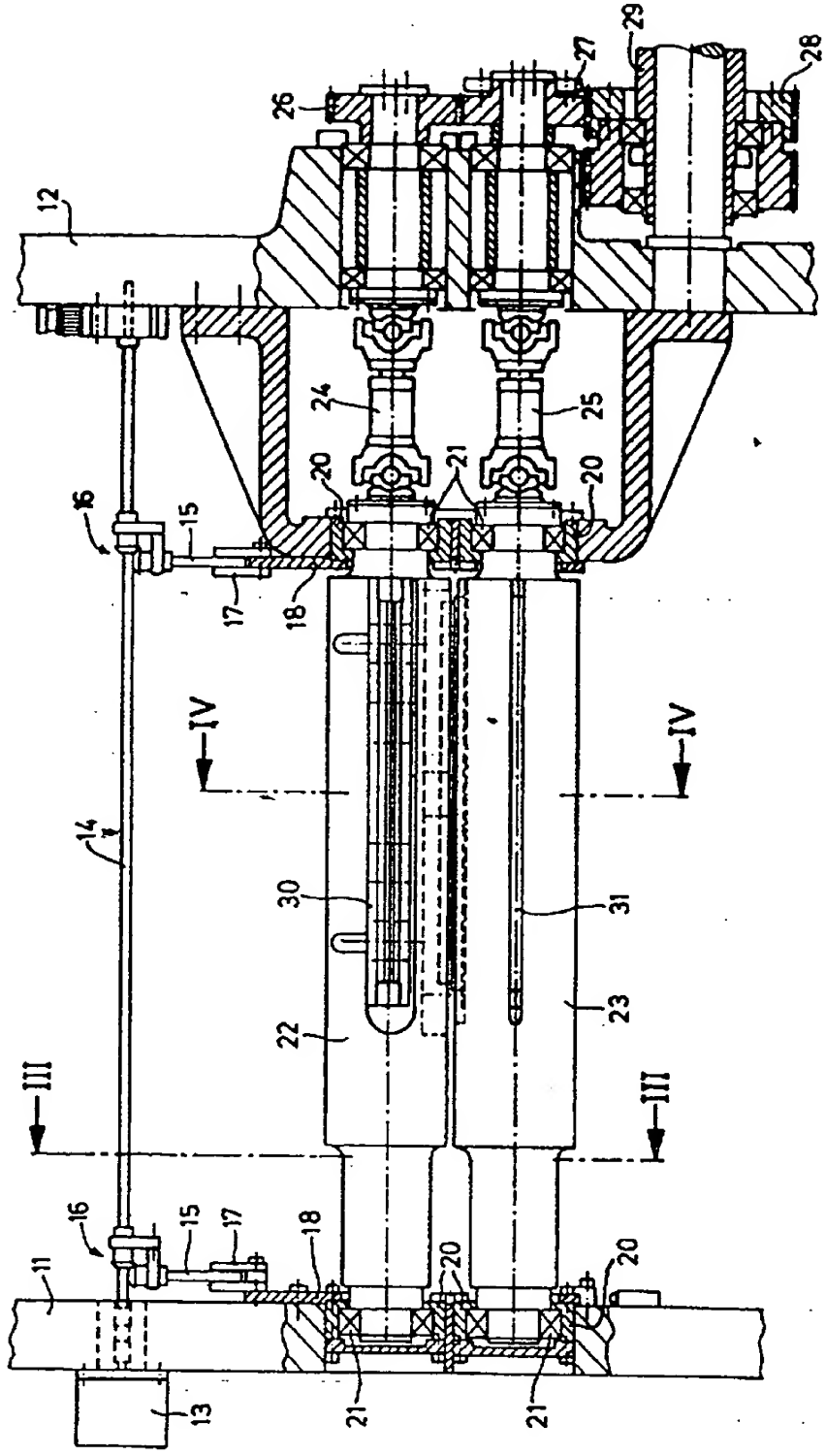

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Fig. 2

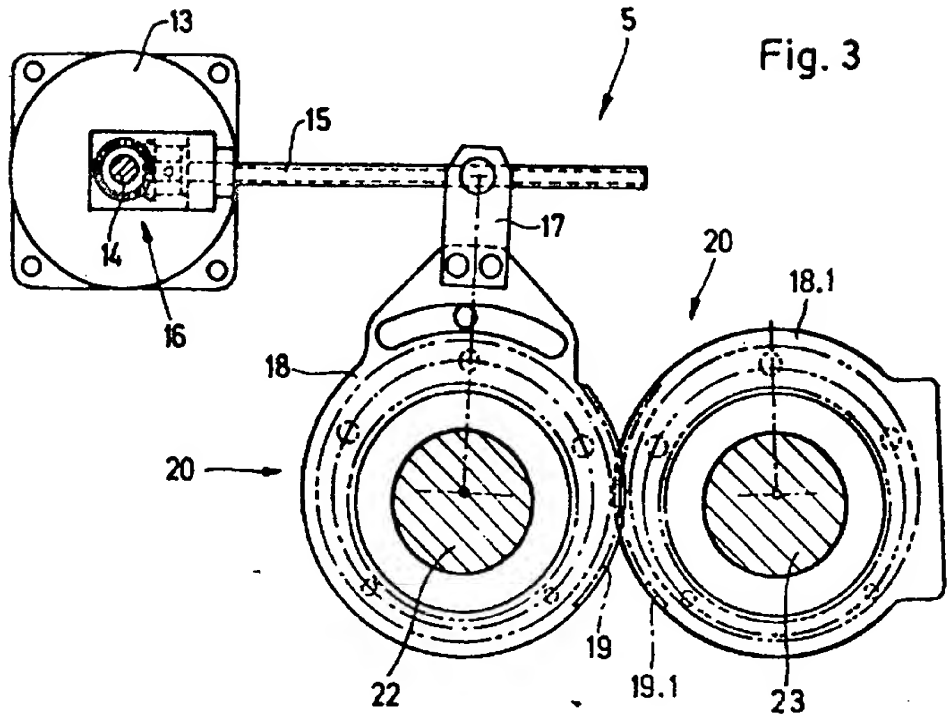
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Fig. 3

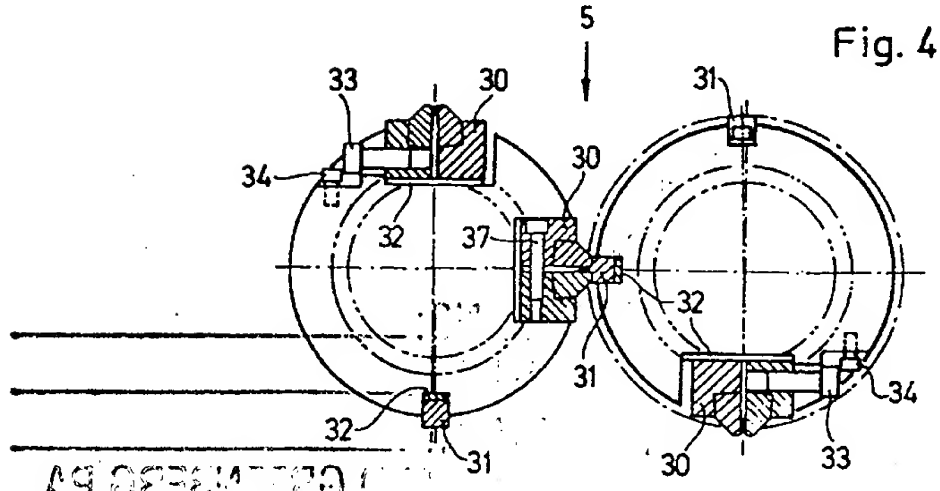
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Fig. 4

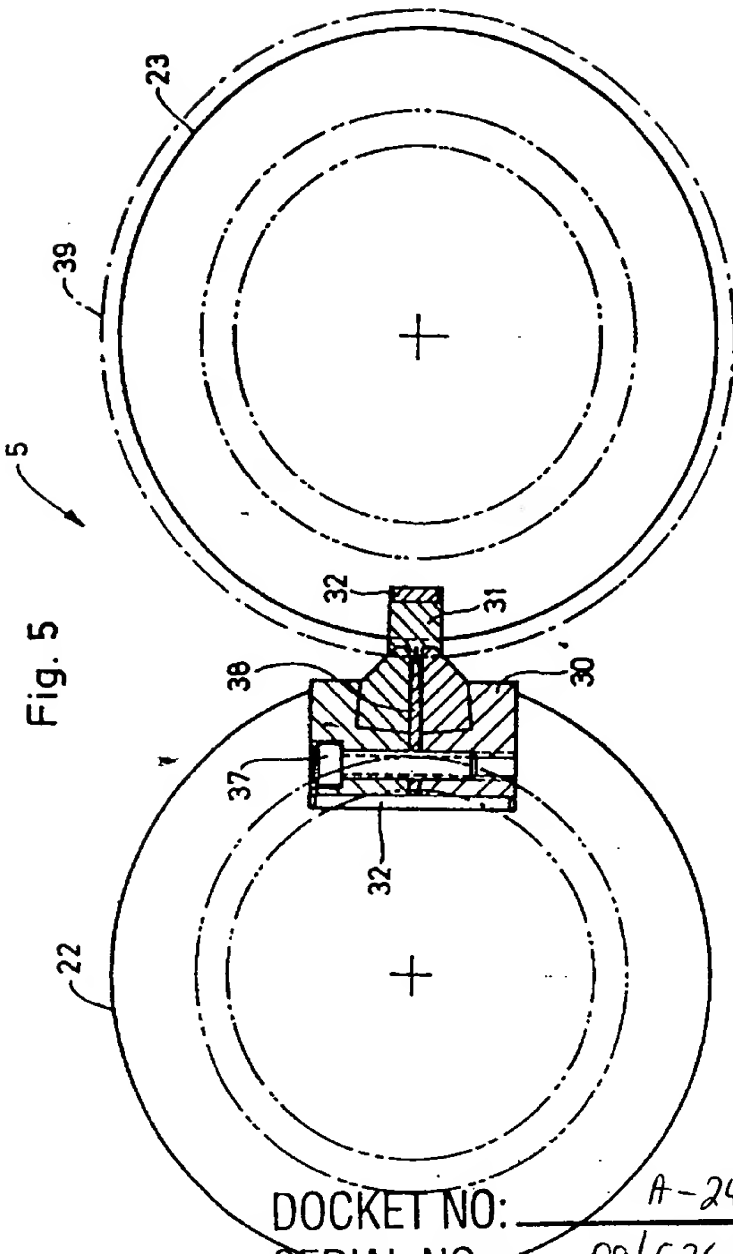

Fig. 5

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